CLAIMS

What is claimed is:

1. A phased array antenna having a frequency selective surface, comprising:

a substrate and an array of antenna elements thereon, each antenna element comprising a medial feed portion and a pair of legs extending outwardly therefrom, adjacent legs of adjacent antenna elements including respective spaced apart end portions;

at least one fluidic dielectric having a permittivity and a permeability residing within at least one cavity within the substrate and arranged between a plane where the array of antenna elements reside and a ground plane;

at least one composition processor adapted for dynamically changing a composition of said fluidic dielectric to vary at least one of said permittivity and said permeability in said at least one cavity; and

a controller for controlling said composition processor to selectively vary at least one of said permittivity and said permeability in at least one cavity in response to a control signal.

2. The frequency selective surface of claim 1, wherein said at least one cavity comprises a plurality of quartz capillary tubes.

3. The frequency selective surface of claim 1, wherein each of said at least one composition processor is independently operable for adding and removing said fluidic dielectric from each of said at least one cavity.

4. The frequency selective surface according to claim 1, wherein said fluidic dielectric is comprised of an industrial solvent.

5. The frequency selective surface according to claim 4, wherein said fluidic dielectric is comprised of an industrial solvent that has a suspension of magnetic particles contained therein.

6. The frequency selective surface according to claim 5, wherein said magnetic particles are formed of a material selected from the group consisting of ferrite, metallic salts, and organo-metallic particles.

7. The frequency selective surface according to claim 1, wherein the array of antenna elements comprises an array of dipole antenna elements.

8. The frequency selective surface according to claim 1, wherein the array of antenna elements comprises an array of slot antenna elements.

9. A phased array antenna, comprising:

a substrate and an array of antenna elements thereon, each antenna element comprising a medial feed portion and a pair of legs extending outwardly therefrom, adjacent legs of adjacent antenna elements including respective spaced apart end portions;

at least one fluidic dielectric having a permittivity and a permeability able to reside within at least one cavity within at least one dielectric layer, wherein the dielectric layer resides between the substrate and a ground plane;

at least one composition processor adapted for dynamically changing a composition of said fluidic dielectric to vary at least one of said permittivity and said permeability in said at least one cavity; and

a controller for controlling said composition processor to selectively vary at least one of said permittivity and said permeability in at least one cavity in response to a control signal.

10. The phased array antenna of claim 9, wherein the phased array antenna further comprises at least one conductive plane adjacent to the substrate for providing additional coupling between adjacent dipole antenna elements.

11. The phased array antenna according to claim 9, wherein the phased array antenna has a desired frequency range and wherein said ground plane is spaced from the array of dipole antenna elements less than about one-half a wavelength of a highest desired frequency.

12. The phased array antenna according to claim 9, wherein the spaced apart end portions in the adjacent legs comprise interdigitated portions.

13. The phased array antenna according to claim 12, wherein each leg comprises an elongated body portion, an enlarged width end portion connected to an end of the elongated body portion, and a plurality of fingers extending outwardly from said enlarged width end portion.

14. The phased array antenna according to claim 9 wherein each phased array antenna has a desired frequency range and wherein the spacing between the end portions of adjacent legs is less than about one-half a wavelength of a highest desired frequency.

15 The phased array antenna according to claim 9, wherein the array of dipole antenna elements comprises first and second sets of orthogonal dipole antenna elements to provide dual polarization.

16. The phased array antenna of claim 9, wherein the phased array antenna forms a part of a feedthrough lens antenna having a coupling structure connecting a first and a second phased array antenna together in back-to-back relation.

17. The phased array antenna according to claim 16, wherein said coupling structure comprises a ground plane.

18. The phased array antenna according to claim 9, wherein the at least one conductive plane resides between the substrate and the ground plane.

19. The phased array antenna of claim 9, wherein said at least one composition processor dynamically changes the composition of said fluidic dielectric by mixing fluidic dielectric having different permittivity and permeability values.

20. A phased array antenna, comprising:

a current sheet array on a substrate;

at least one dielectric layer between the current sheet array and a ground plane; and

at least one cavity within said at least one dielectric layer for retaining at least one fluidic dielectric having a permittivity and a permeability;

at least one fluidic pump unit for adding and removing said at least one fluid dielectric to and from said at least one cavity in response to a control signal.

21. The phased array antenna according to claim 20, wherein the current sheet array comprises the substrate carrying an array of dipole antenna elements.

22. The phased array antenna of claim 21, wherein the phased array antenna further comprises at least one conductive plane adjacent to the substrate for providing additional coupling between adjacent dipole antenna elements of the current sheet array.

23. A method for beam forming a radio frequency signal radiated from an antenna using a frequency selective surface, comprising the steps of:

propagating the radio frequency signal through the frequency selective surface;

dynamically changing the composition of a fluidic dielectric within the frequency selective surface to vary at least one among a permittivity and a permeability in order to vary a propagation delay of said radio frequency signal through the frequency selective surface.

24. The method according to claim 23, further comprising the step of selectively adding and removing a fluidic dielectric from selected ones of a plurality of cavities of the frequency selective surface in response to a control signal.

25. The method according to claim 23, wherein the step of dynamically changing the composition of fluidic dielectric comprises the step of mixing fluidic dielectric to obtain a desired permeability and permittivity.

26. The method according to claim 23, wherein the step of dynamically changing the composition of fluidic dielectric comprises the step adding and removing the fluidic dielectric to obtain a desired permeability and permittivity.

27. A method of maintaining a constant impedance over a wide frequency range in a phased array antenna having a frequency selective surface, comprising the steps of:

dynamically changing a composition of a fluidic dielectric within the phased array antenna to vary at least one among array parameters selected from the group comprising coupling among elements of the frequency selective surface, resonances of said elements, and an effective groundplane spacing between said elements and a groundplane; and

operating the phased array antenna over the wide frequency range as the composition of the fluidic dielectric is dynamically changed.

28. A phased array antenna, comprising:

a frequency selective surface;

means for dynamically changing a composition of a fluidic dielectric within the phased array antenna to vary at least one among array parameters selected from the group comprising coupling among elements of the frequency selective surface, resonances of said elements, and an effective groundplane spacing between said elements and a groundplane;

means for operating the phased array antenna over a wide frequency range as the composition of the fluidic dielectric is dynamically changed while maintaining a constant impedance over the wide frequency range.